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MEIOFAUNAL DIVERSITY AND DENSITY OF MANAMELKUDI – AN INTERTIDAL SANDY BEACH OF PALK BAY, INDIA

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ABSTRACT: A two-year investigation of meiofauna and its related major ecological parameters was made in the sandy beach of Manamelkudi, Palk Bay, South East Coast of India. Samples were collected from January 2016 to December 2017 from the mid-tidal level of the intertidal region. Samples were taken up to 15 cm depth using a 2.5 cm diameter PVC corer. Grain size composition showed the existence of mean grain size range between 0.207 and 0.592 mm. The temperature varied between 27.4 and 30.2 ˚C. The dissolved oxygen values were from 3.29 to 6.59 mg/l. Salinity range was between 29.09 – 33.96 PSU. Eighty species of meiofauna belonging to 19 taxa were recorded. Foraminiferans, turbellarians, nematodes, gastrotrichs, archiannelids, polychaetes, oligochaetes, ostracods, copepods, isopods and insects formed most prevailed taxa of the study. Nematodes were the diverse taxa (25), followed by harpacticoids (11). The total meiofaunal density was high during November 2016 (6873 individuals/10cm^2). This study indicates the existence of dense and diverse meiofaunal assemblages supported by favorable physicochemical conditions in Manamelkudi.

KEYWORDS: Meiofauna, Diversity, Sandy beach, Palk Bay.

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1. INTRODUCTION

Superficially sandy beaches appear like a pile of sand; in reality, they support a wide range of underappreciated biodiversity [1], in their interstitial system where a handful of moist beach sand can harbor several hundreds of microscopic invertebrates called meiofauna [2]. Meiofauna are operationally defined based on the standardized mesh size of sieves with 500 µm (1000 µm) as upper and 44 µm (63 µm) as lower limits [3]. The meiofauna has representatives of almost all invertebrate

phyla: the best represented are arthropods and nematodes, while gastrotrichs, tardigrades, gnathostomulids, loriciferans and kinorhynchs are exclusively meiofaunal [3]. Other phyla present are platyhelminthes, acoela, annelids, molluscans and recently described, Hemichordata - Enteropneusta [4]. Living in aquatic sediments, meiofauna plays an important role as a trophic link between bacteria and macrofauna [5]. Owing to their high abundance and diversity, widespread distribution, rapid generation times and fast metabolic rates, meiofaunal organisms are essential contributors to ecosystem processes and functions [6, 7]. In addition, they are also known as sensitive indicators of environmental disturbance and have great potential as pollution indicators [8, 9, 10, 11]. As the sandy beaches provide high socio-economical benefits in the form of coastal fisheries and tourism a better knowledge of the meiofauna is absolutely necessary to frame a sustainable management policy [12]. Hence the present study was undertaken from the sandy beach of Manamelkudi, a prominent fishing area of Palk Bay. As the studies on meiofauna of this area are limited the present investigation was undertaken to compile and critically analyze the species diversity, taxa diversity and community structure of meiofauna and also to understand their relationship with major physicochemical parameters studied.

2. MATERIALS AND METHODS

Sampling station and sampling strategy

The present study was conducted in the intertidal sandy beach of Manamelkudi (10.04' N – 79.26' E) Palk Bay, India (Figure 1).

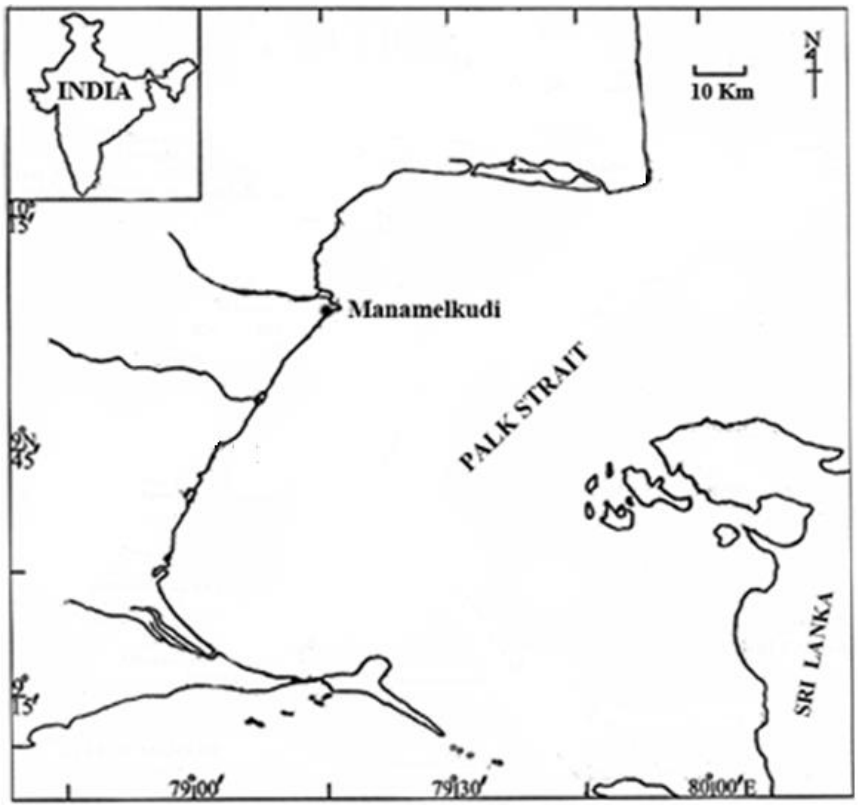

Figure 1: Map of our study area showing the sampling station

The sampling of meiofauna and physicochemical parameters was conducted for a period of 24 months from January 2016 (Jan.16) to December 2017 (Dec.17). Sampling was done in the mid-tidal level of the intertidal region. The station is an exposed micro-tidal sandy beach characterized by a short intertidal area of ~1 meter. Accumulation of seagrass is the characteristic feature of the station.

Physicochemical parameters

Physicochemical parameters such as grain size, surface water temperature, dissolved oxygen (DO) and salinity were studied. Grain size composition was analyzed following standard methods [13,14]. The temperature was recorded with the help of mercury thermometer, DO of seawater was estimated by modified Winkler's method [15]. Salinity was estimated by Mohr's titrimetric method.

Collection of sediment containing meiofauna

The sediment containing meiofauna was collected by pushing 2.5 cm diameter PVC corer upto 15 cm depth. Sampling was made during low tide, at the mid-tide level of the intertidal region. Collected samples were immediately fixed with Rose Bengal formalin (0.5 g/l) and transported to the laboratory for extraction.

Laboratory process

From the sediment meiofauna was separated by decantation method, animals passing through sieves of 1,000 µm mesh size and retained in 63 µm mesh size were considered as meiofauna. The decantation process was repeated for five times to extract maximum fauna from the sediment. The separated meiofaunal concentrate was made up to 10 ml with 5% buffered formalin and was stored in 50 ml plastic containers until further processing. Qualitative species-level identification was done by preparing temporary and permanent mounts of meiofauna and comparing with the standard taxonomic descriptions [16, 17, 18, 19, 20, 21, 22, 23, 24, 25]. For quantitative analysis, 1 ml of the subsample was taken using a wide-mouthed pipette on to a Sedgwick-Rafter counting chamber and was enumerated under a stereo-zoom microscope. Triplicate subsamples was enumerated and their mean density was expressed as individuals per $10cm^2$ (ind./$10cm^2$). Adults of harpacticoid and cyclopoid copepods treated as copepods. The larval forms of copepods i.e., nauplii and copepodids were treated as copepod larvae. Collembolans and insects were treated separately. In quantitative analysis nemertines, sipunculans, thermosbenaceans, cumaceans, eggs and unidentified forms were treated as others.

Statistical analysis

Data on meiofauna density obtained in the present study was subjected to the ANOVA to understand whether there exist any significant relations in the meiofaunal densities of different months. Spearman's rank correlation was done to analyze the relation between meiofauna and physicochemical parameters. To assess the species homogeneity among the meiofaunal populations ecological diversity indices like Species richness (S), Total individuals (N), Shannon-Wiener

diversity index (H′)[26], Simpson dominance index (D')[27] and evenness index (J') [28] were computed. Multivariate analysis such as cluster dendogram, non-metric Multidimensional Scaling (nMDS) was computed using Bray-Curtis similarity to determine the similarity in the diversity and taxa density of meiofauna during different months. Statistical analysis was carried out using SPSS 16.0 and PRIMER 5.

3. RESULTS AND DISCUSSION

The intertidal sandy beaches are dynamic environments where interactions between the sand grains and waves create a complex environment in their interstitial system. The animals of interstitial system are known to studied since the early days of the microscope invention, however, the studies on their diversity patterns and interactions are relatively poor in some parts of the World [29,30]. Nevertheless by having 60% representatives of animal phyla [3, 16] meiofauna constitute a major part of marine biodiversity [31].

Meiofaunal species diversity

The qualitative estimation shows the occurrence of eighty species of meiofauna, of which a maximum of 25 species was nematodes. Moderate diversity was seen in copepods (10 species), polychaetes (6 species), gastrotrichs (5 species) and turbellarians (4 species). For certain groups such as nemertines, cladocerans, sipunculans, and bivalves we were unable to identify beyond taxa level (Table - 1). The species diversity recorded was similar to other sandy beaches studied around the world, it has been ascertained that the distribution and biodiversity of different faunal size groups can vary across different habitats and environmental conditions [32, 33]. Total number of species recorded in the present study is comparable to similar studies [34, 35]. According to Giere [3], the careful examination might find as many as 40,000 meiofaunal species in a given area. The higher diversity of endobenthic forms such as nematodes suggest that in interstitial habitats, small-bodied phyla are preadapted as represented by more species than the larger ones. However, the larger forms have their aberrant forms as representatives [36]. Like most meiobenthic studies in the present study also nematodes ranked first on the basis of species diversity and the harpacticoids ranked second.

Taxa diversity

Nineteen major taxa were recorded from the two year study period, they are foraminiferans, ciliates, cnidarians, turbellarians, nemertines, nematodes, gastrotrichs, rotifers, polychaetes, oligochaetes, cladocerans, ostracods, copepods, copepod larvae, ostracods, isopods, halacarids, collembolans, other insects, bivalves and others. The meiofaunal taxa diversity was between 8 and 14. Minimum (8) was recorded during Mar. 16, while maximum (14) was observed on seven different months (Table - 2). The taxa diversity recorded in the present study was moderate, generally ~10 taxa were present at a given month. The taxa such as oligochaetes, turbellarians, nematodes, and copepods were the regular and dominant taxa, the taxa diversity and dominance of these groups are similar to Chennai coast [37]. While studying the latitudinal difference in meiofaunal taxa, Kotwicki et al [12]

reported a number of taxa in the tropical region are higher than the temperate and Arctic regions. The number of major taxa recorded increases with the rate of exposure and linearly with average grain size [38], the microtidal and less exposed conditions could be the reason for lesser diversity in Manamelkudi.

Table 1: Meiofaunal species recorded at Manamelkudi of Palk Bay, India

Meiofauna
Foraminiferans
Elphidium sp.
Ciliates
Litonotus sp.
Cnidarians
Halammohydra sp1.
Psammohydra nanna
Turbellarians
Acanthomacrostomum gerlachi
Macrostomum sp.
Otoplana sp.
Acoela sp.
Nemertines
Nematodes
Halalaimus setosus
Desmodora sp.
Chromodora sp.
Sabatieria sp.
Metepsilonema sp.
Gammarinema sp.
Gnomoxyala sp.
Thalassironus sp.
Rhabdodemania sp.
Synonema sp.
Xenolaimus sp.
Thoracostoma sp.
Thalassomonhystera sp.
Enoplolaimus sp.
Oxonchus sp.
Hypodontolaimus sp.
Litinium sp.
Terschellingia sp.
Mesacanthion sp.
Camacolaimus sp.
Gastrotrichs
Thaumastoderma sp.
Pseudostomella roscovita
Turbanella sp.
Xenotrichula sp.
Crasiella sp.
Rotifers
Brachionus sp.
Polychaetes
Polygordius madrasensis
Saccocirrus minor
Hesionides sp.
Eusyllis homocirrata
Pisione complexa
Parapodrilus sp.
Oligochaetes
Marionina sp.
Grania sp.
Sipunculan
Cladoceran
Ostracods
Eucypris sp.
Harpacticoid copepods
Arenosetella indica
Ameira parvula
Parapseudoleptomesochra trisetosa
Apodopsyllus camptus
Apodopsyllus madrasensis
Leptastacus euryhalinus
Psammastacus acuticaudatus
Arenopontia (Neoleptastacus) indica
Arenopontia subterranea
Cylindropsyllis sp.
Cyclopoid copepod
Neocyclopina sp.
Thermosbaenacean
Halosbaena acanthura
Isopods
Angeliera phreaticola
Microcerberus predatoris
Halacarids
Acarochelopodia cuneifera
Scaptognathus hallezi
Insects
Collembolans
Bivalve

Table 2: Taxa diversity (number of taxa), Total density (individuals/10cm^2) and dominant taxa recorded from Manamelkudi of Palk Bay, India

Month & Year	Number of taxa	Dominant taxa
Jan. 16	13	Oligochaetes, Nematodes
Feb. 16	14	Oligochaetes, Nematodes
Mar. 16	8	Turbellarians, Nematodes
Apr. 16	14	Nematodes, Turbellarians
May. 16	14	Turbellarians, Nematodes
Jun. 16	12	Turbellarians, Polychaetes
Jul. 16	14	Oligochaetes, Nematodes
Aug. 16	11	Oligochaetes, Nematodes
Sep. 16	12	Nematodes, Turbellarians
Oct. 16	9	Oligochaetes, Nematodes
Nov. 16	14	Turbellarians, Oligochaetes
Dec. 16	13	Nematodes, Copepods
Jan. 17	13	Copepods and Other Insects
Feb. 17	11	Oligochaetes, Nematodes
Mar. 17	13	Oligochaetes, Nematodes
Apr. 17	9	Oligochaetes, Nematodes
May. 17	11	Oligochaetes, Nematodes
Jun. 17	14	Oligochaetes, Nematodes
Jul. 17	11	Oligochaetes, Nematodes
Aug. 17	11	Oligochaetes, Nematodes
Sep. 17	13	Oligochaetes, Turbellarians
Oct. 17	12	Oligochaetes, Turbellarians
Nov. 17	14	Oligochaetes, Nematodes
Dec. 17	14	Oligochaetes, Nematodes

Physicochemical parameters and meiofaunal density

The grain size of Manamelkudi, intertidal zone consists more of even sized sand particles, dominated by very angular, sub-angular and sub-rounded sand grains. The grain size ranged between 0.207 to 0.592 mm. The sea water temperature ranged between 27.4 to 30.2 ºC, monsoon and winter months were recorded with low temperature while high values were seen during summer. The dissolved oxygen was found to be between 3.29 and 6.59 mg/l. The values of salinity were from 29.09 to 33.96 PSU, low values were recorded during rainy/monsoon months (Table - 3).

Table 3: Physicochemical parameters recorded at Manamelkudi Palk Bay, India

Month & Year	Mean Grain Size (mm)	Temperature (ºC)	Dissolved Oxygen (Mg/l)	Salinity (PSU)
Jan. 16	0.300	27.4	5.66	32.78
Feb. 16	0.207	27.6	6.52	32.86
Mar. 16	0.264	28.8	6.59	32.68
Apr. 16	0.314	29.6	5.62	33.58
May. 16	0.425	30	5.66	31.78
Jun. 16	0.441	28.6	6.52	32.29
Jul. 16	0.293	29.6	6.22	32.83
Aug. 16	0.293	29.4	4.94	33.11
Sep. 16	0.344	29.8	3.7	32.01
Oct. 16	0.31	29.6	3.29	31.81
Nov. 16	0.312	29	3.49	30.76
Dec. 16	0.408	27.4	3.49	30.48
Jan. 17	0.592	27.6	4.63	32.58
Feb. 17	0.388	28	3.3	31.32
Mar. 17	0.37	28.6	3.3	32.86
Apr. 17	0.344	29.2	3.91	33.5
May. 17	0.338	30.2	5.98	32.42
Jun. 17	0.463	30	3.47	33.96
Jul. 17	0.425	30.8	4.87	31.14
Aug. 17	0.35	29.6	3.89	32.88
Sep. 17	0.452	29	4.49	32.17
Oct. 17	0.366	30.2	4.94	31.6
Nov. 17	0.329	29.2	3.87	29.09
Dec. 17	0.359	29	4.27	30.53

The total density of meiofauna ranged from 492 (Jun.17) to 6873 (Nov.17) ind./10cm^2 (Figure 2). Oligochaetes, turbellarians, nematodes, and copepods were the regular and dominant taxa of Manamelkudi. The density of oligochaetes ranged between 11 and 3311 ind./10cm^2, the two-year average percentage contribution 43%, which is followed by turbellarians their density was from 7 to 3300 ind./10cm^2 while their two years average percentage contribution was 18%. Nematode density range was between 44 and 1244 ind./10cm^2, their two years average percentage contribution was 15% and while the copepods density ranged from 0 to 994 ind./10cm^2 their two-year average

percentage was 8%. The contribution of remaining taxa was meager (Figure 3; Table - 4).

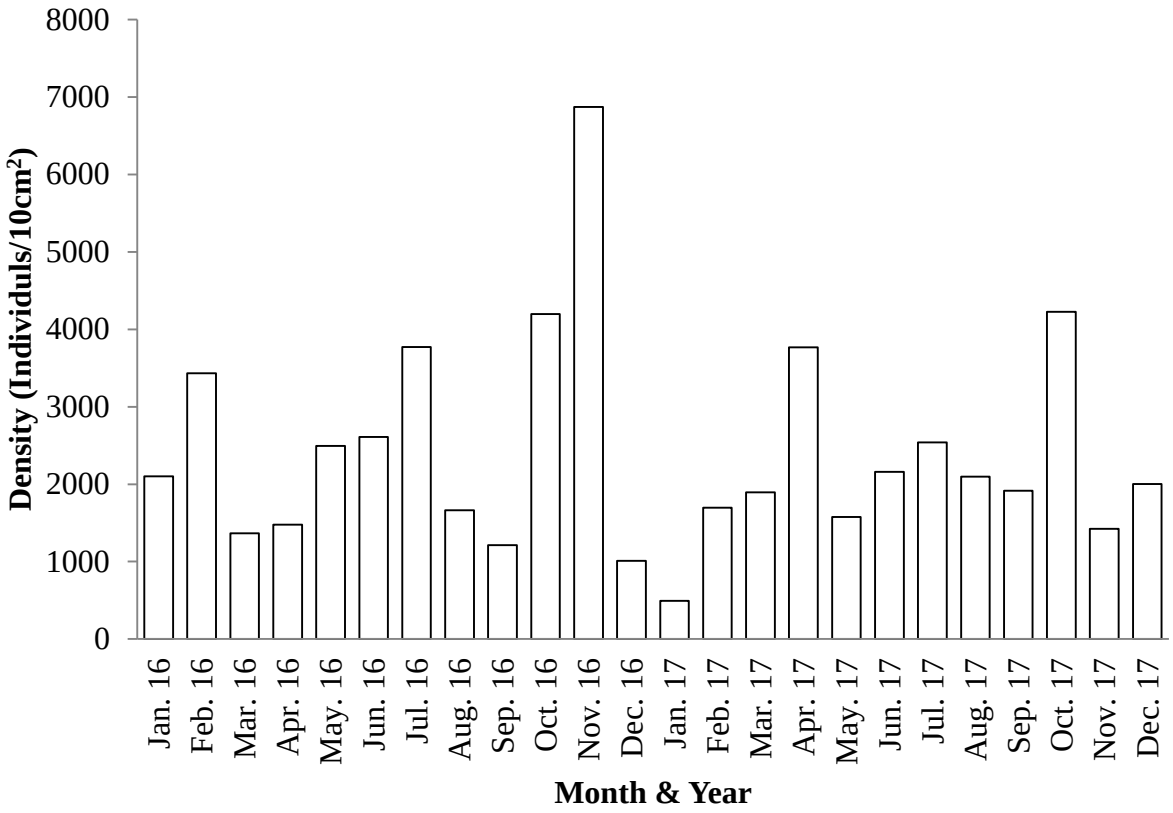

Figure 2: Total meiofaunal density (individuals/10cm²) of Manamelkudi

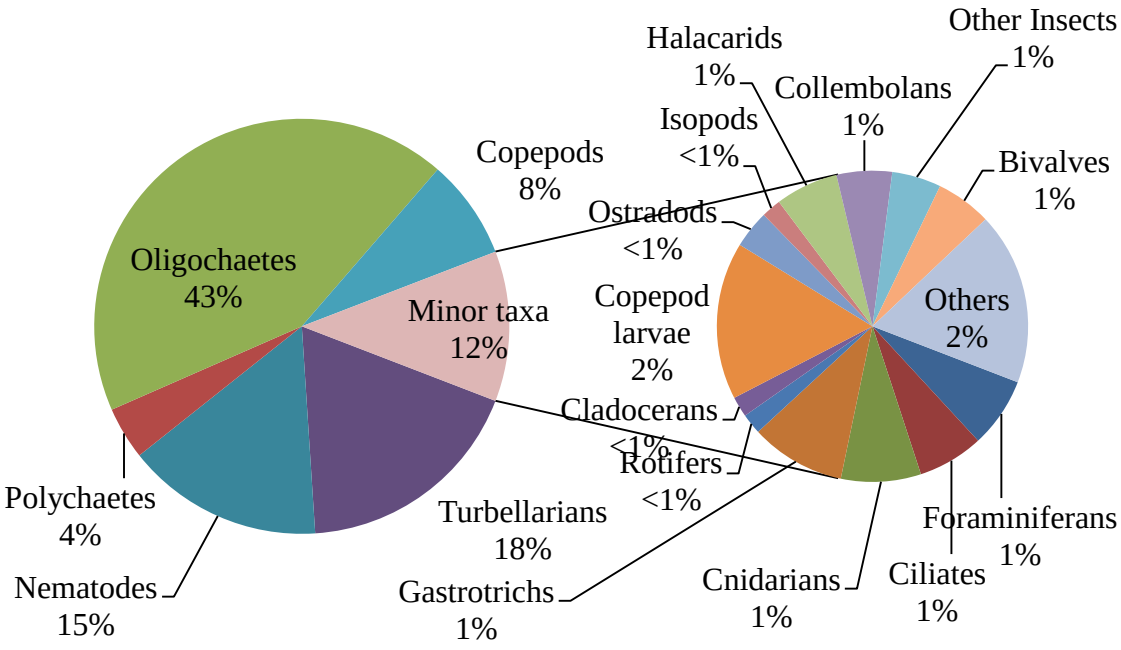

Figure 3: Pie-diagram showing average percentage contribution of meiofaunal taxa at Manamelkudi

Table 4: Meiofaunal taxa density (individuals/10cm^2) of Manamelkudi

Month &Year	F	C	Cn	T	N	G	R	P	O	Cd	Cp	Cl	Os	I	H	Co	Oi	B	Ot
Jan. 16	39	33	22	50	228	0	0	44	1317	0	189	33	28	0	0	22	0	56	39
Feb. 16	17	11	11	172	667	0	39	211	1878	0	211	50	0	0	33	22	56	0	56
Mar. 16	0	0	0	300	456	0	0	83	294	0	133	61	22	0	0	0	0	0	17
Apr. 16	22	25	31	386	444	0	0	39	189	0	119	22	0	39	39	56	0	22	44
May. 16	28	22	28	1094	558	150	28	111	117	0	200	28	0	0	28	0	0	44	58
Jun. 16	8	0	8	1239	253	161	0	317	236	0	181	117	28	0	0	28	0	0	33
Jul. 16	22	22	125	500	617	0	22	283	1833	0	92	133	0	0	28	11	42	0	42
Aug. 16	33	28	28	125	328	0	0	66	856	0	61	39	0	0	0	0	0	50	50
Sep. 16	11	6	6	333	406	0	0	61	200	0	50	39	0	28	22	0	50	0	0
Oct. 16	22	0	0	444	1244	167	0	0	1300	0	917	44	11	0	0	50	0	0	0
Nov. 16	28	44	17	3300	383	0	0	194	1622	39	994	186	0	0	22	22	0	11	11
Dec. 16	22	28	28	228	311	22	0	22	11	28	267	22	0	0	0	0	11	0	11
Jan. 17	33	39	39	33	44	0	0	44	50	0	83	22	50	0	22	11	22	0	0
Feb. 17	0	0	0	178	417	30	0	30	956	28	0	8	0	0	13	13	0	4	20
Mar. 17	17	11	17	311	394	0	0	39	889	0	83	0	50	0	0	28	22	22	13
Apr. 17	0	22	0	106	167	22	0	0	3311	22	0	0	0	28	0	0	0	22	67
May. 17	56	0	44	50	100	0	0	33	1150	0	33	0	33	0	13	33	0	0	33
Jun. 17	33	39	0	186	403	22	28	64	758	0	269	161	22	0	0	28	0	39	106
Jul. 17	3	11	22	283	447	0	0	203	1267	0	39	0	0	0	39	0	0	39	186
Aug. 17	17	17	39	7	78	7	0	42	1764	0	77	0	0	0	0	22	0	0	27
Sep. 17	6	17	0	228	128	0	0	50	1189	28	56	0	22	0	56	22	0	56	56

Oct. 17	17	22	6	583	267	44	0	250	2383	0	333	0	0	22	56	0	0	0	242
Nov. 17	44	39	50	178	311	44	28	56	389	0	44	72	0	0	0	0	72	28	67
Dec. 17	17	28	44	194	250	0	0	139	950	0	83	72	0	22	72	22	72	0	39

(F – Foraminiferans, C – Ciliates, Cn – Cnidarians, T – Turbellarians, N – Nematodes, G – Gastrotrichs, R – Rotifers, P – Polychaetes, O - Oligochaetes, Cd – Cladocerans, Cp – Copepods, Cl – Copepod larvae, Os – Ostracods, I – Isopods, H – Halacarids, Co – Collembolans, Oi – Other Insects, B – Bivalves, Ot – Others)

The density of meiofauna in the intertidal region of the sandy beaches depends on the exposure, grain size and fluctuation in the physicochemical parameters, availability of food, intra and interspecific competitions for food and feeding also govern the density. The total density of meiofauna ranged from 492 (Jun.17) to 6873 (Nov.17) ind./10cm^2 can be considered as high density considering the nature of the beach and physicochemical conditions. Studies indicate density was usually low in polar regions [12, 39] and moderate in tropics [40]. Meiofaunal density reported is similar to various sandy beaches of India [41, 42]. The tropical conditions with favorable physicochemical parameters, ideal interstices formed by the sand particles and suitable feeding and breeding conditions might be the probable reasons for the high density of meiofauna in Manamelkudi station. The physicochemical conditions of Manamelkudi, intertidal zone, reflects a typical micro-tidal beach and similar to Ratnagiri [43]. The temperature and salinity were high during summer while the oxygen never went below 3.29 mg/l providing a well-oxygenated condition for the life, low values of temperature and salinity during rainy/monsoon months is a usual phenomenon of Palk Bay coastal habitats [44]. The physicochemical characteristics affect the distribution and growth of the benthic organisms [45].Oligochaetes were found to be regular and predominant taxa with 43% which is followed by turbellarians with 18%, nematodes with 15% and harpacticoids 8%.

Spearman's rank Correlation

The results of Spearman's rank correlation analysis between the physicochemical parameters shows median sand grain size had a significant negative effect ($p < 0.05$) on nematodes, oligochaetes, ostracods, and total meiofaunal density, the temperature was positively correlated ($p < 0.05$) with cladocerans and other groups. Taxa such as polychaetes and cnidarians were positively correlated ($p < 0.05$) with DO; copepods and cladocerans were a negative correlation with DO ($p < 0.05$). Salinity has significant positive correlation ($p < 0.05$) with ostracods. The correlation shows that sand grain size had a significant negative effect ($p < 0.05$) on nematodes, oligochaetes, ostracods, and total meiofaunal density. This suggests that larger grain size provided more interstitial space and unstable environment for the dominant taxa. Positively correlation of temperature with cladocerans

and other groups, suggests seasonal characters of these groups.

Univariate ecological indices

The results of ecological indices (Shannon-Weiner diversity, Margalef's species richness, evenness (Pielou's J) and dominance index (Simpson's 1-λ) were presented in Table – 5.

Table 5: Univariate indices of Manamelkudi

Month & Year	Shannon-Wiener diversity indices (H')	Margalef's species richness (d)	Evenness (Pielou's J)	Dominance (Simpson's 1-λ)
Jan. 16	1.45	1.57	0.56	0.58
Feb. 16	1.53	1.60	0.58	0.65
Mar. 16	1.69	0.97	0.81	0.78
Apr. 16	2.03	1.78	0.77	0.81
May. 16	1.80	1.66	0.68	0.74
Jun. 16	1.74	1.40	0.70	0.73
Jul. 16	1.67	1.58	0.63	0.71
Aug. 16	1.62	1.35	0.68	0.69
Sep. 16	1.80	1.55	0.72	0.78
Oct. 16	1.57	0.96	0.71	0.76
Nov. 16	1.49	1.47	0.56	0.69
Dec. 16	1.83	1.73	0.71	0.78
Jan. 17	2.46	1.94	0.96	0.91
Feb. 17	1.28	1.34	0.53	0.61
Mar. 17	1.61	1.59	0.63	0.71
Apr. 17	0.58	0.97	0.26	0.22
May. 17	1.18	1.36	0.49	0.46
Jun. 17	2.01	1.69	0.76	0.81
Jul. 17	1.56	1.28	0.65	0.70
Aug. 17	0.76	1.31	0.32	0.29
Sep. 17	1.46	1.59	0.57	0.59
Oct. 17	1.49	1.32	0.60	0.65
Nov. 17	2.21	1.79	0.84	0.85
Dec. 17	1.87	1.71	0.71	0.74

Shannon-Weiner Diversity

The Shannon-Weiner diversity represents the proportion of species density in the population. It is being at a maximum when all species occur in a similar number of individuals and the lowest when the sample contains one species. In the present study Shannon-Wiener diversity indices (H') ranged between 0.58 (Apr.17) and 2.46 (Jan.17) as H' represents number of species and their density, we find low values when the taxa density is dominated by single taxa as we saw on Apr. 17 where the density was mainly due to oligochaetes. The highest value on Jan. 17 is due to the even contribution of density by more number of taxa.

Margalef's Species Richness

Margalef's species richness (d) ranged between 0.96 (Oct.16) and 1.94 (Jan.17), as the richness represents the species count we find low values when the number of taxa present was low. High values were seen when more number of taxa are present.

Evenness Index

Evenness is measured with a standardized index of species abundance (evenness or equitability), that is typically on a scale ranging from near 0 (indicates low evenness or high single-species dominance) to 1 (indicates high evenness or dominance shared by more species). In the present study evenness (Pielou's J) ranged between 0.26 (Apr.17), where the oligochaetes dominated the density. High evenness values on 0.96 (Jan.17) indicates the sharing of density by more than 10 taxa.

Simpson Dominance Index

Dominance has an inverse relation with diversity; low dominance indicates high diversity (dominated by more number of taxa), whereas high dominance indicates low diversity (dominated by few taxa). The dominance index (Simpson's 1-λ) of our study was minimum (0.22) during Apr.17 and maximum 0.91 during Jan.17 (Table - 6). The values indicate less number of taxa were present during Apr.17, while a number of taxa were present during Jan.17. Ecological indices are useful in community-level investigations to study the role of species at different stages of succession [46, 47, 48]. Hence they are increasingly used by ecologists to explore the relationships between organisms and ecosystem functioning [49].

Multivariate Analysis

Cluster analysis non-metric Multi-Dimensional Scaling (nMDS)

The Bray-Curtis similarity based cluster dendogram analysis was computed based on the total meiofaunal density. The months with higher density formed close neighbors, while the highest and lowest density months were seen as furthest neighbors (Figure 4). The ecological indices studied indicate the existence of rich and diverse meiofaunal assemblages in the station. The availability of better food and other physicochemical conditions for a specific taxon lead to their dominance in that month. Availability of diverse food and other factors favored more taxa which lead to less dominance and high evenness.

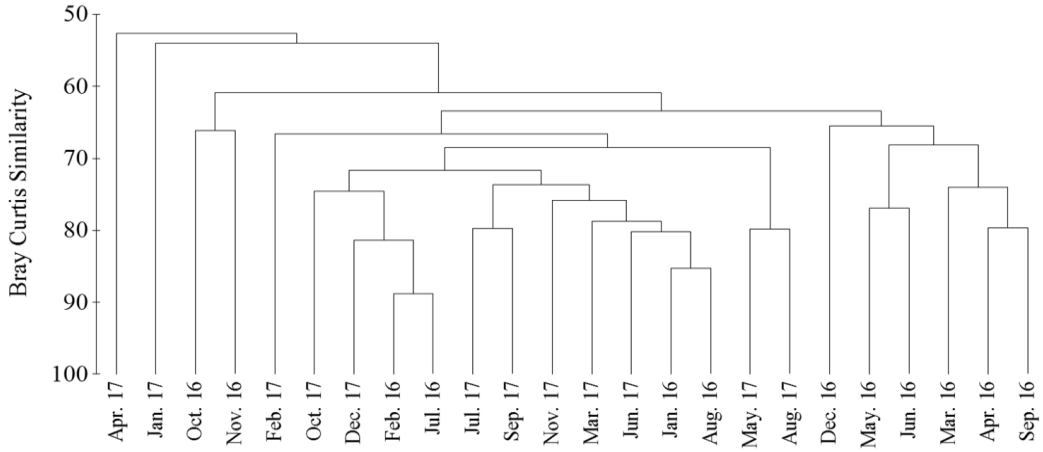

Figure 4: Cluster dendogram of meiofauna different months at Manamelkudi

The nMDS analysis (based on Bray-Curtis similarity) of meiofaunal taxa reveals variations in the density among the different major taxa (Figure 5). The formation of a group consisting of oligochaetes, turbellarians, nematodes, and copepods reveals the high level of similarity in the density between these taxa. The rare taxa present only during few months such as rotifers and other insects also formed a grouped.

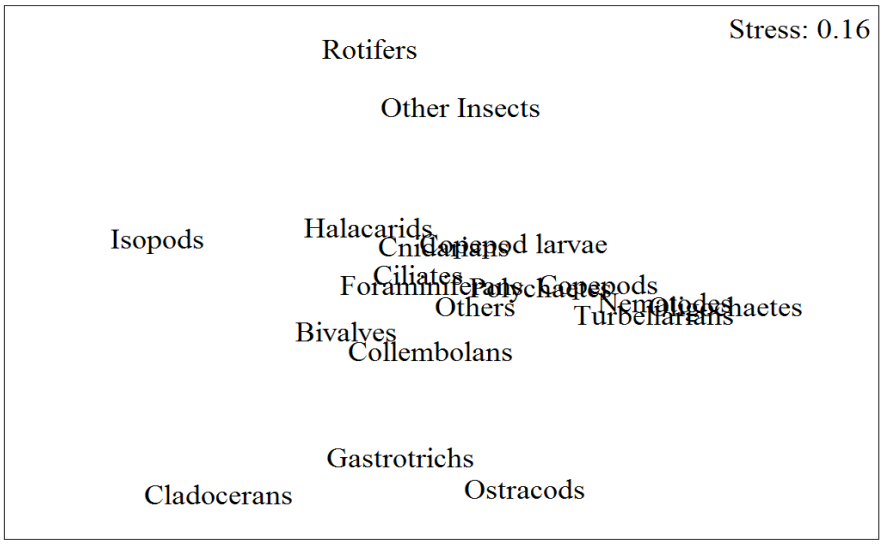

Figure 5: Multi Dimensional Scaling analysis of meiofauna of Manamelkudi

4. CONCLUSION

The meiofaunal community of Manamelkudi showed the existence of a diverse group of taxa belonging to a wide range of invertebrate phyla. The physicochemical parameters have influenced meiofaunal taxa both positively and negatively. The undisturbed/less disturbed state of the station might have favored the diverse and dense meiofaunal taxa. The study can be considered as a baseline data for the meiofaunal studies on Palk Bay and the future can be built on it. More detailed species-level investigations, the inclusion of a few other vital physicochemical parameters, food and feeding analysis and energetic analysis might reveal further details on the meiofauna this station.

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CONFLICT OF INTEREST

Authors have no any conflict of interest.

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